

1 **TITLE OF THE INVENTION**

2 **APPARATUS FOR PROCESSING SIGNAL IN MONITOR**

3 **CLAIM OF PRIORITY**

4 [0001] This application makes reference to, incorporates the same herein, and claims all benefits
5 accruing under 35 U.S.C. §119 from an application for *AN APPARATUS FOR PROCESSING*
6 *SIGNAL OF MONITOR* earlier filed in the Korean Industrial Property Office on 30 June 2001 and
7 there duly assigned Serial No. 2001-38811.

8 **BACKGROUND OF THE INVENTION**

9 **Field of the Invention**

10 [0002] The present invention relates to a display apparatus, and more particularly, to a display
11 apparatus capable of indicating a picture-in-picture (PIP) function on a color display tube (CDT)
12 monitor.

13 **Description of the Related Art**

14 [0003] With a jump to a higher level of information society, multimedia systems have rapidly
15 come into wide use. Accordingly, the importance of display devices functioning as a bridge between
16 human beings and electronic devices has increased.

17 [0004] Analog signals have been generally used when displaying a signal from a personal

1 computer (PC) or television/video through a CDT monitor system. As shown in FIG. 1, a signal
2 from a PC 10 is amplified by an amplification unit 11 and is displayed on a CDT 12 monitor such
3 as a cathode-ray tube. On the other hand, digital data must be used when a signal from the PC or
4 television/video is displayed through a liquid crystal display (LCD) monitor system.

5 [0005] In order to realize the PIP (picture-in-picture) function of indicating at least one sub-screen
6 together with one main screen at the same time, as an optional function of a monitor, a signal from
7 a PC or television/video must undergo a digital signal process. Therefore, the PIP function can be
8 more easily realized in the LCD monitor than in the CDT monitor. To realize the PIP function in
9 the CDT monitor, a scaler integrated circuit (IC) that is used in the LCD monitor is needed.
10 However, when the scaler IC is used, a signal is displayed on the CDT screen after being converted
11 into a digital signal, processed with a PIP process in the scaler IC, and then converted back into an
12 analog signal. During these processes, screen image quality may be degraded.

SUMMARY OF THE INVENTION

13 [0006] It is therefore an object of the present invention to provide an apparatus for processing
14 signals in a monitor so that an image of high definition is displayed without any degradation of
15 image quality when the PIP function is realized in the CDT monitor.

16 [0007] It is another object to have an apparatus for processing signals in a monitor for the picture-
17 in-picture function that is easy to manufacture.

18 [0008] It is another object to have an apparatus for processing signals in a monitor for the picture-

1 in-picture function that is inexpensive to manufacture.

2 [0009] Accordingly, the above and other objects are achieved by an apparatus for processing a
3 signal. It is preferable that the apparatus includes a signal dispensing unit for dispensing an output
4 signal output from a personal computer in the form of an analog or digital signal and outputting the
5 same, a signal processing unit for performing picture-in-picture signal processing enabling one of
6 a digital personal computer signal generated by the signal dispensing unit and a decoded television
7 or video signal input from an outside source to be displayed on a main screen and the other to be
8 displayed on one or more sub-screens, and for processing the television or video signal to be
9 displayed alone on the main screen, an outputting unit for outputting an analog personal computer
10 signal generated from the signal dispensing unit in response to a control signal for displaying only
11 the person computer signal, and outputting an output signal of the signal processing unit in response
12 to a control signal for displaying the picture-in-picture and television or video signals, and a monitor
13 for amplifying the signal output from the outputting unit to be displayed.

14 [0010] It is preferable that the apparatus further includes a signal conversion unit for converting
15 the picture-in-picture signal output from the signal processing unit into an analog signal before a
16 signal is output from the outputting unit. The signal processing unit includes a decoding unit for
17 converting the television or video signal into a digital signal and decoding the same, a scan rate
18 conversion unit for converting a scan rate of the decoded television or video signal, and a signal
19 processing unit for performing a picture-in-picture signal process on the television or video signal
20 whose scan rate is converted and the digital personal computer signal, so that one of the television

1 or video and the digital personal computer signal is displayed on the main screen and the other of
2 the television or video and the digital personal computer signal is displayed on the plurality of sub-
3 screens, or for processing the television or video signal to be displayed alone on the main screen.

4 **BRIEF DESCRIPTION OF THE DRAWINGS**

5 **[0011]** A more complete appreciation of the invention, and many of the attendant advantages
6 thereof, will be readily apparent as the same becomes better understood by reference to the following
7 detailed description when considered in conjunction with the accompanying drawings in which like
8 reference symbols indicate the same or similar components, wherein:

9 **[0012]** FIG. 1 is a block diagram of an apparatus for processing signals in an earlier color display
10 tube (CDT) monitor; and

11 **[0013]** FIG. 2 is a block diagram of an apparatus for processing signals in a monitor according to
12 the present invention.

13 **DETAILED DESCRIPTION OF THE INVENTION**

14 **[0014]** Turning now to the drawings, referring to FIG. 2, the apparatus includes an ADC (analog
15 to digital converter) 21 for converting an analog signal output from a personal computer 20 into a
16 digital signal, a decoding unit 23 for converting a signal from a television or video 22 into a digital
17 signal and decoding the same, a scan rate conversion unit 24 for changing a scan rate of the decoded
18 signal from the television or video 22, a signal processing unit 25 for performing the picture-in-

1 picture (PIP) function of displaying one of the personal computer (PC) 20 signal output from the
2 ADC 21 and the television or video 22 signal output from the scan rate conversion unit 24 on the
3 main screen and displaying the other on a plurality of sub-screens, or processing the television or
4 video signal to be displayed, a DAC (digital to analog converter) 26 for converting an output signal
5 generated from the signal processing unit 25 into an analog signal, an outputting (switching) unit 27
6 for outputting the analog signal output from the personal computer 20 when only the personal
7 computer 20 signal is displayed and outputting a signal output from the DAC 26 when both the PC
8 20 signal and the television or video 22 signal are displayed using the picture-in-picture function,
9 an amplifying unit 28 for amplifying a signal output from the outputting unit 27, and a color display
10 tube 29 for displaying the amplified signal.

11 [0015] In FIG. 2, the apparatus for processing a signal in the monitor is operated largely in three
12 modes including displaying a signal from the PC 20 (1st mode), displaying a signal from the
13 television or video (TV/video) (2nd mode); and displaying two or more signals at the same time, *i.e.*,
14 picture-in-picture function (3rd mode). The television signal can be defined as broadcast video
15 signals used to display an image that are for example transmitted through the air or through mediums
such as conducting wire, fiber optics, or other mediums. The video signal can be defined as any
16 possible signal that can be used to display an image and may include for example non-broadcast
17 video signals such as from a video cassette recorder, digital versatile disc, video compact disc, and
18 other media that can be used to generate a video image. The television or video signal can for
19 example be originally in formats such as NTSC (National Television Standards Committee),
20

1 SECAM (Sequential Color and Memory System), PAL (Phase Alternating Line), or other formats.
2 The signal from the personal computer 20 can be for example in a VGA (Video Graphics Array)
3 mode format or other modes with higher resolution (*i.e.*, SVGA for super video graphics array, XGA
4 for extended graphics array, *etc.*). The signals above have varying constraints such as frequencies
5 and resolutions.

6 [0016] In the first mode, the color display tube 29 displays a signal from the personal computer
7 20 without modification. A signal from the personal computer 20 is selected by inputting an
8 outputting (switching) control signal to the outputting unit 27. The selected signal from the personal
9 computer 20 is amplified by the amplifying unit 28 and output to the color display tube 29. A signal
10 dispensing unit 40 for dispensing a pure analog signal output from the personal computer 20 and
11 a digital signal passing through the ADC 21 is included in the apparatus. In the first mode, the
12 analog signal from the personal computer 20 is output from the signal dispensing unit 40.

13 [0017] In the second mode, a signal from the television or video unit 22 is converted into a digital
14 signal and decoded in the decoding unit 23. For smoothly processing a signal, a scan rate of the
15 decoded signal from the television or video is changed by the scan rate conversion unit 24. A
16 horizontal frequency of the personal computer 20 is 30 ~ 85 kHz (17", 19" diagonal measurement
17 of display screen) and that of the television or video 22 is 15.7 kHz (kilohertz) and thus, an error due
18 to a large difference between the horizontal frequencies may be made during signal processing. This
19 problem can be solved by changing the scan rate of a signal generated from the television or video
20 22. A television or video 22 signal having a horizontal frequency of 15.7 kHz is changed to have

1 a horizontal frequency of 31.4 kHz when passing through the scan rate conversion unit 24. The
2 television or video 22 signal whose scan rate is changed is scaled in the signal processing unit 25
3 to be displayed on the CDT 29. The scaled television or video 22 signal passes through the DAC
4 26 and is then converted into an analog signal. A signal output from the DAC 26 is selected by
5 inputting an outputting control signal to the outputting unit 27. The selected signal from the PC 20
6 is amplified in the amplifying unit 28 and output to the CDT 29.

7 [0018] In the third mode, at least two signals are displayed (PIP function) at the same time, *i.e.*,
8 the signals of the PC 20 and the TV/video 22 are displayed at the same time. According to one
9 embodiment of the third mode, a digital signal output by the PC 20 is output from the signal
10 dispensing unit 40 to the signal processing unit 25. The signal from the TV/video 22 passes through
11 the decoding unit 23 and the scan rate conversion unit 24 and is output to the signal processing unit
12 25. In this mode, the signal processing unit 25 selects a main screen and sub-screens, processes a
13 signal to correspond to a selected screen and processes a scaling for displaying the signal. As
14 another embodiment, to realize the PIP function, a signal from the PC 20 and a signal from the
15 TV/video are displayed, one on the main screen and the other on a sub-screen. A PIP signal
16 generated from the signal processing unit 25 is converted into an analog signal in the DAC 26. In
17 this mode, a signal output from the DAC 26 is selected by inputting an outputting control signal to
18 the outputting unit 27. The selected signal from the PC 20 is amplified in the amplifying unit 28 and
19 output to the CDT 29. The function of the outputting unit 27 is the same in the second and third
20 modes, *i.e.*, it is controlled to switch an output signal of the DAC 26. However, the function of the

1 DAC 26 is not the same. That is, the DAC 26 outputs the scaled signal of the PC 20 to be displayed
2 in the second mode, whereas it outputs signals from the PC 20 and the TV/video 22, which are PIP
3 processed, to be displayed in the third mode.

4 **[0019]** According to the above-described apparatus, a pure signal from the PC 20, a signal from
5 the TV/video 22 or a PIP signal that is the combined signals from the PC 20 and the TV/video 22,
6 is displayed on the CDT 29.

7 **[0020]** While this invention has been particularly shown and described with reference to a
8 preferred embodiment thereof, it will be understood by those skilled in the art that various changes
9 in form and details may be made therein without departing from the spirit and scope of the invention
10 as defined by the appended claims.

11 **[0021]** As described above, according to the present invention, the PIP function can be realized,
12 and also, a signal of high definition can be displayed on the CDT monitor.